around it resulting in independent Canadian and American schemes of stratigraphic nomenclature being proposed.

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The Colony Shale Oil Project

For many years, the oil shale "boom" in western Colorado has been just around the corner. Now, the Colony Shale Oil Project, a joint development of The Oil Shale Corp. and Exxon Corp., is under full construction and will be the nation's first full-sized commercial shale oil project. The Colony operation, located in Garfield County in northwestern Colorado, is targeted for production at a rate of 47,000 bbl/day of synthetic oil in early 1986. To support the plant, it will be necessary to produce 66,000 tons/day of oil shale from a conventional room-and-pillar mine.

The shale will be hauled from the mine in 85-ton trucks and crushed to −9 in. (229 mm) in a 72 × 109 in. (1.8 × 2.8 m) gyratory crusher. The coarse ore will then be transported by a 72 in. (1.8 m) conveyor belt 5,000 ft (1,525 m) to the secondary crushing station where it will be further reduced to −½ in. (13 mm) by eleven impactor crushers. The finely crushed shale will enter six Tosco II retorts, each capable of processing 11,000 tons/day. When heated to 900°F (482°C) in the pyrolysis drum, the kerogen vaporizes and is separated from the spent shale. The oil shale vapors are then condensed, fractionated, and upgraded by hydrotreating before entering a pipeline to be transported to a conventional refinery. By-products ammonia, sulfur, and coke will be recovered from the upgrading process.

To mitigate the impact of a large work force on the sparsely populated Western Slope, Colony is developing the Battlement Mesa community on the Colorado River 15 mi (24 km) south of the project site. When completed, the community will house approximately 25,000 residents in a variety of housing types, and will be the second largest town in western Colorado. Colony is providing the equivalent of interest-free loans to local organizations for the establishment of schools, a fire station, and other needed facilities.

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Variation in Depositional Systems Along Shoreline Embayments—Modern and Ancient Examples

The stratigraphic record of strandline depositional environments shows a systematic change along shoreline embayments in response to changes in the ratio of wave-energy flux to tidal-energy flux. Waves diminish in size and tidal ranges increase from the entrances to the heads of such embayments.

A depositional model for shoreline embayments emphasizing sand bodies shows the following: *embayment entrance*—wave-dominated deltas, microtidal barriers, abundant washover fans, and flood-tidal deltas in lagoons; *mid-zone*—mixed-energy deltas, mesotidal barriers, numerous inlets, back-barrier tidal-channel sands; and *embayment head*—tide-dominated deltas, offshore tidal sand ridges, no barriers, extensive marsh/tidal flat systems.

Two ancient shoreline embayments, along the Carboniferous shoreline of the southern Appalachians and the Late Cretaceous shoreline of Wyoming and Colorado, illustrate the model. Both examples illustrate a change in sand-body geometry from microtidal, wave-dominated barriers at the entrances to mesotidal, inlet-dominated barriers farther inside the embayments.

Thus, subsurface exploration for sand bodies containing economic deposits should focus on strandline-parallel sands with lagoonward building washovers and flood-tidal deltas at embayment entrances, and strand-perpendicular tidal sands at embayment heads. Exploration in the mid-zones of the embayments would be the most difficult, because of the complexity brought about by the migration of tidal inlets at the shoreline and tidal channels in the back-barrier area.

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Diagenetic Model for Carbonate Rocks in Mid-Continent Pennsylvanian Eustatic Cyclothems

Diagenetic patterns in cyclic Mid-Continent Pennsylvanian carbonates are readily explained in terms of a predictive diagenetic model derived logically from the eustatic depositional model for widespread Pennsylvanian cyclothems. Transgressive shoal-water calcarenites are characterized by overpacking of grains, discernible neomorphism (with excellent preservation of structure) of originally aragonitic grains (ooids, green algae, mollusks), and ferroan calcite and dolomite cement, which indicate movement from the marine phreatic environment of deposition and diagenesis into the low-oxygen deeper burial connate zone, with substantial compaction before any cementation. Offshore invertebrate calcarenites associated with offshore ("core") shales also are characterized by overpacking of grains and ferroan carbonate cements, which indicate a similar diagenetic history. Regressive shoal-water calcarenites show a much greater variety of diagenetic features, including early marine cement rims and large-scale leaching of originally aragonitic grains, commonly with subsequent collapse of micrite envelopes, grain fragments, and overlying material in samples insufficiently stabilized by early cement rims. This was followed by pervasive cementation by blocky calcite before much further compaction, then by ferroan calcite, and finally ferroan dolomite in remaining voids. This pattern indicates replacement of depositional marine phreatic water by meteoric water, which dissolved unstable carbonate grains and then deposited stable carbonate cements in environments that eventually became increasingly oxygen-depleted and otherwise chemically changed, probably as mixing-zone and deeper connate water moved back into the rock and replaced the meteoric water during and after the succeeding transgression. Trends in calcilutites are essentially similar to those in calcarenites of equivalent phase of deposition, with evidence of subaerial exposure and meteoric vadose soil formation in strata at the top of many regressive limestones. It is apparent that with the regression of the sea and emergence that terminated deposition of a cyclothem, meteoric water penetrated the permeable parts of the regressive carbonate and left its distinctive diagenetic patterns of early leaching and cementation before much compaction occurred, but rarely did meteoric water penetrate the impermeable offshore shale, which acted as a seal and allowed associated deep-water and underlying transgressive carbonates to become more deeply buried and substantially compacted before cementation, with unstable grains undergoing slow neomorphism in the absence of leaching.

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Facies Associations in Slope-to-Shelf Transition: Precambrian Miette to Lower Cambrian Gog Group, Kicking Horse Pass, Southern Canadian Rocky Mountains

In the eastern Kicking Horse Pass, Miette sediments consist of